

Internet Engineering Task Force
Internet-Draft
Intended status: Informational
Expires: April 26, 2012

M. Mawatari
Japan Internet Exchange Co.,Ltd.
M. Kawashima
NEC AccessTechnica, Ltd.
October 24, 2011

464XLAT: Combination of Stateful and Stateless Translation
draft-mawatari-softwire-464xlat-01

Abstract

This document describes a method (464XLAT) for IPv4 connectivity across IPv6 network by combination of stateful translation and stateless translation. 464XLAT is a simple technique to provide IPv4 access service while avoiding encapsulation just by using twice IPv4/IPv6 translation standardized in [RFC6145] and [RFC6146].

Status of this Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF). Note that other groups may also distribute working documents as Internet-Drafts. The list of current Internet-Drafts is at <http://datatracker.ietf.org/drafts/current/>.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

This Internet-Draft will expire on April 26, 2012.

Copyright Notice

Copyright (c) 2011 IETF Trust and the persons identified as the document authors. All rights reserved.

This document is subject to BCP 78 and the IETF Trust's Legal Provisions Relating to IETF Documents (<http://trustee.ietf.org/license-info>) in effect on the date of publication of this document. Please review these documents carefully, as they describe your rights and restrictions with respect to this document. Code Components extracted from this document must include Simplified BSD License text as described in Section 4.e of the Trust Legal Provisions and are provided without warranty as

described in the Simplified BSD License.

Table of Contents

| | |
|---|---|
| 1. Introduction | 3 |
| 2. Requirements Language | 3 |
| 3. Terminology | 3 |
| 4. Network Architecture | 4 |
| 5. Applicability | 4 |
| 6. Implementation Considerations | 4 |
| 6.1. IPv6 Address Format | 4 |
| 6.2. DNS Proxy Implementation | 5 |
| 6.3. IPv6 Fragment Header Consideration | 5 |
| 6.4. Auto Prefix Assignment | 5 |
| 7. Deployment Considerations | 5 |
| 8. Security Considerations | 6 |
| 9. IANA Considerations | 6 |
| 10. Acknowledgements | 6 |
| 11. References | 7 |
| 11.1. Normative References | 7 |
| 11.2. Informative References | 7 |
| Authors' Addresses | 7 |

1. Introduction

The IANA unallocated IPv4 address pool was exhausted on February 3, 2011. It is likely that each RIR's unallocated IPv4 address pool will exhaust in the near future. In this situation, it will be difficult for most ISPs to assign global IPv4 address to end users.

This document describes an IPv4 over IPv6 solution as one of the measures of IPv4 address exhaustion and encouragement of IPv6 deployment.

This method (464XLAT) in this document is using twice IPv4/IPv6 translation standardized in [RFC6145] and [RFC6146]. It does not need DNS64 [RFC6147] technology for the purpose of providing IPv4 over IPv6 service by this method. It is also possible to provide single IPv4/IPv6 translation service, which will be needed in the near future. This feature is one of the advantages, because it can be an encouragement to gradually transition to IPv6.

This method is a combination of existing technologies and provides a simple way of providing connectivity to the IPv4 Internet without the use of a CGN nor a port mapping algorithm.

2. Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119].

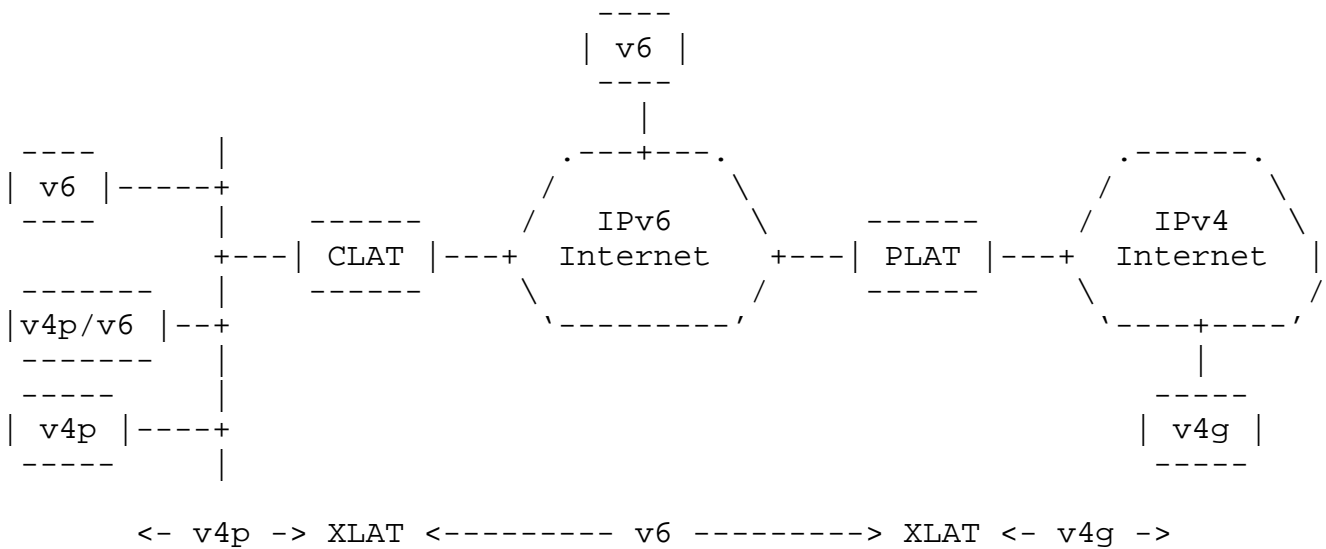
3. Terminology

PLAT: PLAT is Provider side translator(XLAT). A stateful translator complies with [RFC6146] that performs 1:N translation. It translates global IPv6 address to global IPv4 address, and vice versa.

CLAT: CLAT is Customer side translator(XLAT). A stateless translator complies with [RFC6145] that performs 1:1 translation. It algorithmically translates private IPv4 address to global IPv6 address, and vice versa. It has also IPv6 router function that can forward IPv6 packet for IPv6 hosts in end-user network. Furthermore, it has DNS Proxy function with IPv6 transport that provides name resolution for IPv4 hosts and IPv6 hosts in end-user network. The presence of DNS64 [RFC6147] and any port mapping algorithm are not required.

4. Network Architecture

464XLAT method is shown in the following figure.



v6 : Global IPv6
 v4p : Private IPv4
 v4g : Global IPv4

Figure 1: Network Topology

5. Applicability

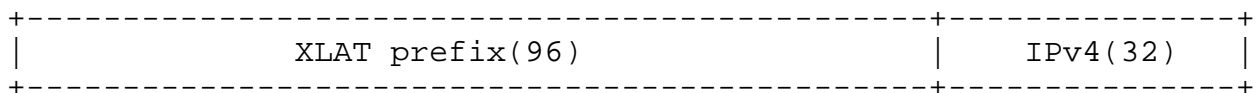
When ISP has IPv6 access network infrastructure and 464XLAT, ISP can provide IPv4 service to end users.

If the IXP or another provider operates the PLAT, all ISPs have to do is to deploy IPv6 access network. All ISPs do not need IPv4 facilities. They can migrate quickly their operation to an IPv6-only environment. Incidentally, Japan Internet Exchange(JPIX) is providing 464XLAT trial service since July 2010.

6. Implementation Considerations

6.1. IPv6 Address Format

IPv6 address format in 464XLAT is presented in the following format.



IPv6 Address Format for 464XLAT

Source address and destination address have IPv4 address embedded in the low-order 32 bits of the IPv6 address. The format is defined in Section 2.2 of [RFC6052]. However, 464XLAT does not use the Well-Known Prefix "64:ff9b::/96".

6.2. DNS Proxy Implementation

CLAT perform DNS Proxy for IPv4 hosts and IPv6 hosts in end-user network. It MUST provide name resolution with IPv6 transport. It does not need DNS64 [RFC6147] function.

6.3. IPv6 Fragment Header Consideration

In the 464XLAT environment, the PLAT and CLAT SHOULD include an IPv6 Fragment Header, since IPv4 host does not set the DF bit. However, the IPv6 Fragment Header has been shown to cause operational difficulties in practice due to limited firewall fragmentation support, etc. Therefore, the PLAT and CLAT may provide a configuration function that allows the PLAT and CLAT not to include the Fragment Header for the non-fragmented IPv6 packets. At any rate, both behaviors SHOULD match.

6.4. Auto Prefix Assignment

Source IPv6 prefix assignment in CLAT is via DHCPv6 prefix delegation or another method. Destination IPv6 prefix assignment in CLAT is via some method. (e.g., DHCPv6 option, TR-069, DNS, HTTP, etc.)

7. Deployment Considerations

Even if the Internet access provider for consumers is different from the PLAT provider (another Internet access provider or Internet exchange provider, etc.), it can implement traffic engineering independently from the PLAT provider. Detailed reasons are below.

1. The Internet access provider for consumers can figure out IPv4 source address and IPv4 destination address from translated IPv6 packet header, so it can implement traffic engineering based on IPv4 source address and IPv4 destination address (e.g. traffic monitoring for each IPv4 destination address, packet filtering for each IPv4 destination address, etc.). The Tunneling methods

do not have such a advantage, without any deep packet inspection for visualizing the inner IPv4 packet of the tunnel packet.

2. If the Internet access provider for consumers can assign IPv6 prefix greater than /64 for each subscriber, this 464XLAT method can separate IPv6 prefix for native IPv6 packets and XLAT prefix for IPv4/IPv6 translation packets. Accordingly, it can identify the type of packets ("native IPv6 packets" and "IPv4/IPv6 translation packets"), and implement traffic engineering based on IPv6 prefix.

And this 464XLAT method have two capabilities. One is a IPv6 -> IPv4 -> IPv6 translation for sharing global IPv4 addresses, another is a IPv4 -> IPv6 translation for reaching IPv6 only servers from IPv4 only clients that can not support IPv6. IPv4 only clients will remain for a while.

8. Security Considerations

To implement a PLAT, see security considerations presented in Section 5 of [RFC6146].

To implement a CLAT, see security considerations presented in Section 7 of [RFC6145]. And furthermore, the CLAT SHOULD perform Bogon filter, and SHOULD have IPv6 firewall function as a IPv6 router. It is useful function for native IPv6 packet and translated IPv6 packet. The CLAT SHOULD check IPv6 packet received from WAN interface. If the packet is invalid prefix (i.e., it is not XLAT prefix), then SHOULD silently drop the packet. In addition, the CLAT SHOULD check IPv4 packet after the translation. If the packet is not match private IPv4 address of LAN, then SHOULD silently drop the packet.

9. IANA Considerations

This document has no actions for IANA.

10. Acknowledgements

The authors would like to thank JPIX NOC members and Seiichi Kawamura for their helpful comments.

11. References

11.1. Normative References

- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.
- [RFC6052] Bao, C., Huitema, C., Bagnulo, M., Boucadair, M., and X. Li, "IPv6 Addressing of IPv4/IPv6 Translators", RFC 6052, October 2010.
- [RFC6144] Baker, F., Li, X., Bao, C., and K. Yin, "Framework for IPv4/IPv6 Translation", RFC 6144, April 2011.
- [RFC6145] Li, X., Bao, C., and F. Baker, "IP/ICMP Translation Algorithm", RFC 6145, April 2011.
- [RFC6146] Bagnulo, M., Matthews, P., and I. van Beijnum, "Stateful NAT64: Network Address and Protocol Translation from IPv6 Clients to IPv4 Servers", RFC 6146, April 2011.

11.2. Informative References

- [I-D.murakami-softwire-4v6-translation] Murakami, T., Chen, G., Deng, H., Dec, W., and S. Matsushima, "4via6 Stateless Translation", draft-murakami-softwire-4v6-translation-00 (work in progress), July 2011.
- [I-D.xli-behave-divi] Bao, C., Li, X., Zhai, Y., and W. Shang, "dIVI: Dual-Stateless IPv4/IPv6 Translation", draft-xli-behave-divi-03 (work in progress), July 2011.
- [RFC6147] Bagnulo, M., Sullivan, A., Matthews, P., and I. van Beijnum, "DNS64: DNS Extensions for Network Address Translation from IPv6 Clients to IPv4 Servers", RFC 6147, April 2011.

Authors' Addresses

Masataka Mawatari
Japan Internet Exchange Co.,Ltd.
KDDI Otemachi Building 19F, 1-8-1 Otemachi,
Chiyoda-ku, Tokyo 100-0004
JAPAN

Phone: +81 3 3243 9579
Email: mawatari@jpix.ad.jp

Masanobu Kawashima
NEC AccessTechnica, Ltd.
800, Shimomata
Kakegawa-shi, Shizuoka 436-8501
JAPAN

Phone: +81 537 23 9655
Email: kawashimam@vx.jp.nec.com